# AQUATIC INVERTEBRATES AND HABITAT OF BEAR CREEK, PARK COUNTY, MONTANA

July 2000

*FINAL*



**A report to**
**the Montana Department of Environmental Quality**
**Helena, Montana**

**by**
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## INTRODUCTION

This report summarizes data generated from a single aquatic invertebrate sample taken near the mouth of Bear Creek, a tributary of the Yellowstone River, in Park County, Montana. The sample site was located by GPS reading at 45°01'55"N, 110°39'56"W. The sample was collected by personnel of the Montana Department of Environmental Quality (MT DEQ) using the sampling protocol recommended by Bukantis (1998). In addition to the benthic sample, habitat parameters were evaluated using the "Macroinvertebrate Habitat Assessment Field Form" for streams with riffle/run prevalence. Analysis of invertebrates was accomplished by applying the method recommended by Bollman (1998) for streams of western Montana. The method uses a multimetric battery to evaluate disturbance to biotic integrity. A thorough description of the analytic protocol and rationale for its application may be found in numerous reports to MT DEQ by this author.

## RESULTS AND DISCUSSION

Table 1 itemizes the evaluated habitat parameters and shows the assigned scores for each. Habitat conditions were judged optimal; all evaluated parameters were assigned scores suggesting minimal disturbance.

**Table 1.** Stream and riparian habitat assessment for a site on Bear Creek. July 2000.

| Max. possible score | **Parameter** | Bear Creek |
|---|---|---|
| 10 | Riffle development | 10 |
| 10 | Benthic substrate | 10 |
| 20 | Embeddedness | 18 |
| 20 | Channel alteration | 20 |
| 20 | Sediment deposition | 20 |
| 20 | Channel flow status | 18 |
| 20 | Bank stability: left / right | 10 / 10 |
| 20 | Vegetated zone: left / right | 8 / 8 |
| 140 | Total | 132 |
| | Percent of maximum | **94** |
| | CONDITION* | **OPTIMAL** |

*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on Bear Creek fully supports designated uses and supports a benthic assemblage with essentially unimpaired biotic health. However, low abundance of organisms in the sample complicates the evaluation; conclusions and interpretation of results are tenuous. Whether the inadequacy of the sample was due to a depauperate community at the site or to sampling bias is not clear from the data itself, however, field personnel attribute the inadequate sample size to the nature of the substrate. Boulders and bedrock impeded sampling.

**Table 2.** Metric values, scores, and bioassessment for a site on Bear Creek. July 2000.

| | Bear Creek |
|---|---|
| **METRICS** | **METRIC VALUES** |
| **Ephemeroptera richness** | 7 |
| **Plecoptera richness** | 5 |
| **Trichoptera richness** | 4 |
| **Number of sensitive taxa** | 4 |
| **Percent filterers** | 0 |
| **Percent tolerant taxa** | 8 |
| | **METRIC SCORES** |
| **Ephemeroptera richness** | 3 |
| **Plecoptera richness** | 3 |
| **Trichoptera richness** | 2 |
| **Number of sensitive taxa** | 3 |
| **Percent filterers** | 3 |
| **Percent tolerant taxa** | 2 |
| **TOTAL SCORE (max.=18)** | 16 |
| **PERCENT OF MAX.** | **89** |
| **Impairment classification** | **NON** |
| **USE SUPPORT** | **FULL** |

The taxonomic and functional composition of the sampled assemblage can be further interpreted. Other useful metrics appear in the appendix to this report. One of these is the modified biotic index; the value calculated for this assemblage (3.35) suggests that water quality at this site was good. Six mayfly taxa were collected at the site, lending strength to this hypothesis.

Caddisfly taxa richness was somewhat lower than expected for a montane stream, which could be interpreted to suggest that fine sediment deposition may have impaired habitats. Low caddisfly richness may have been a result of the low abundance of organisms in the sample; other insect richness metrics, however, were not similarly affected. The site supported at least 14 "clinger" taxa, which suggests that fine sediments were not in fact a problem at the site. High taxa richness (28) and high diversity of predatory taxa (9) imply that instream habitats were plentiful and diverse. Taxa found at the site include 4 very sensitive organisms, including the predatory net-spinning caddisfly *Parapsyche elsis* and the cold-stenothermic stoneflies *Doroneuria* sp. and *Megarcys* sp. All appropriate functional components that signal integrity of benthic communities were represented in the sample. Five long-lived taxa were collected, suggesting that this site is not subject to seasonal dewatering or other catastrophic insult.

## CONCLUSION

- Taxonomic and functional composition of the sample taken at Bear Creek suggest that habitat and water quality were essentially undisturbed.

## LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Unpublished Master's Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

# APPENDIX

## Taxonomic data and summaries

## Bear Creek

## July 2000

**Aquatic Invertebrate Taxonomic Data**

**Site Name: Bear Creek**
**Site ID: Station 1 7/13/2000**

Approx. percent of sample used: 100

| Taxon | Quantity | Percent | HBI | FFG |
|---|---|---|---|---|
| *Polycelis coronata* | 5 | 2.16 | 4 | CG |
| Tubificidae - immature | 6 | 2.60 | 9 | CG |
| **Total Misc. Taxa** | **11** | **4.76** | | |
| *Baetis tricaudatus* | 15 | 6.49 | 6 | CG |
| *Drunella coloradensis* | 6 | 2.60 | 0 | CG |
| *Serratella tibialis* | 7 | 3.03 | 2 | CG |
| *Cinygmula* sp. | 42 | 18.18 | 4 | SC |
| *Epeorus* sp.-early instar | 18 | 7.79 | 0 | SC |
| *Rhithrogena* sp. | 6 | 2.60 | 0 | SC |
| *Ameletus* sp. | 14 | 6.06 | 0 | CG |
| **Total Ephemeroptera** | **108** | **46.75** | | |
| *Sweltsa* sp. | 7 | 3.03 | 1 | PR |
| *Doroneuria* sp. | 8 | 3.46 | 1 | PR |
| *Kogotus* sp. | 4 | 1.73 | 2 | PR |
| *Megarcys* sp. | 2 | 0.87 | 2 | PR |
| Pteronarcidae - early instars | 1 | 0.43 | 0 | OM |
| **Total Plecoptera** | **22** | **9.52** | | |
| *Parapsyche elsis* | 5 | 2.16 | 1 | PR |
| Rhyacophila Angelita Gr. | 7 | 3.03 | 0 | PR |
| Rhyacophila Betteni Gr. | 1 | 0.43 | 1 | PR |
| *Rhyacphila valuma* | 1 | 0.43 | 1 | PR |
| **Total Trichoptera** | **14** | **6.06** | | |
| *Heterlimnius* sp. | 1 | 0.43 | 4 | CG |
| *Optioservus* sp. | 3 | 1.30 | 4 | SC |
| **Total Coleoptera** | **4** | **1.73** | | |
| *Hexatoma* sp. | 2 | 0.87 | 2 | PR |
| **Total Diptera** | **2** | **0.87** | | |
| *Brillia* sp. | 1 | 0.43 | 5 | SH |
| *Diamesa* sp. | 4 | 1.73 | 5 | CG |
| Eukiefferiella Devonica Gr. | 5 | 2.16 | 4 | OM |
| *Micropsectra* sp. | 6 | 2.60 | 7 | CG |
| *Orthocladius* sp. | 45 | 19.48 | 6 | CG |
| *Pagastia* sp. | 7 | 3.03 | 1 | CG |
| *Tvetenia* sp. | 2 | 0.87 | 5 | CG |
| **Total Chironomidae** | **70** | **30.30** | | |
| **Grand Total** | **231** | **100.00** | | |

**Aquatic Invertebrate Summary Data**

**Site Name: Bear Creek** **Site ID: Station 1 7/13/2000**

| | |
|---|---|
| TOTAL ABUNDANCE | 231 |
| Ephemeroptera + Plecoptera + Trichoptera (EPT) abundance | 144 |
| TOTAL NUMBER OF TAXA | 28 |
| Number EPT taxa | 16 |

TAXONOMIC GROUP COMPOSITION

| GROUP | #TAXA | ABUNDAN | PERCENT |
|---|---|---|---|
| Misc. Taxa | 2 | 11 | 4.76 |
| Odonata | 0 | 0 | 0.00 |
| Ephemeroptera | 7 | 108 | 46.75 |
| Plecoptera | 5 | 22 | 9.52 |
| Hemiptera | 0 | 0 | 0.00 |
| Megaloptera | 0 | 0 | 0.00 |
| Trichoptera | 4 | 14 | 6.06 |
| Lepidoptera | 0 | 0 | 0.00 |
| Coleoptera | 2 | 4 | 1.73 |
| Diptera | 1 | 2 | 0.87 |
| Chironomidae | 7 | 70 | 30.30 |

RATIOS OF TAX GROUP ABUNDANCES

| | |
|---|---|
| EPT/Chironomidae | 2.06 |

FUNCTIONAL FEEDING GROUP (FFG) COMPOSITION

| GROUP | #TAXA | ABUNDAN | PERCENT |
|---|---|---|---|
| Predator | 9 | 37 | 16.02 |
| Parasite | 0 | 0 | 0.00 |
| Collector-gatherer | 12 | 118 | 51.08 |
| Collector-filterer | 0 | 0 | 0.00 |
| Macrophyte-herbivore | 0 | 0 | 0.00 |
| Piercer-herbivore | 0 | 0 | 0.00 |
| Scraper | 4 | 69 | 29.87 |
| Shredder | 1 | 1 | 0.43 |
| Xylophage | 0 | 0 | 0.00 |
| Omnivore | 2 | 6 | 2.60 |
| Unknown | 0 | 0 | 0.00 |

RATIOS OF FFG ABUNDANCES

| | |
|---|---|
| Scraper/Collector-filterer | #DIV/0! |
| Scraper/(Scraper + C.filterer) | 1.00 |
| Shredder/Total organisms | 0.00 |

CONTRIBUTION OF DOMINANT TAXA

| TAXON | ABUNDANCE | PERCENT |
|---|---|---|
| *Orthocladius* sp. | 45 | 19.48 |
| *Cinygmula* sp. | 42 | 18.18 |
| *Epeorus* sp.-early instar | 18 | 7.79 |
| *Baetis tricaudatus* | 15 | 6.49 |
| *Ameletus* sp. | 14 | 6.06 |
| SUBTOTAL 5 DOMINANTS | 134 | 58.01 |
| *Doroneuria* sp. | 8 | 3.46 |
| *Serratella tibialis* | 7 | 3.03 |
| *Sweltsa* sp. | 7 | 3.03 |
| Rhyacophila Angelita Gr. | 7 | 3.03 |
| Pagastia sp. | 7 | 3.03 |
| TOTAL DOMINANTS | 170 | 73.59 |

SAPROBIC INDICES

| | |
|---|---|
| Hilsenhoff Biotic Index | 3.35 |

DIVERSITY MEASURES

| | |
|---|---|
| Shannon H (loge) | 2.42 |
| Shannon H (log2) | 3.50 |
| Evenness | 0.73 |
| Simpson D | 0.09 |

COMMUNITY VOLTINISM ANALYSIS

| TYPE | ABUNDANCE | PERCENT |
|---|---|---|
| Multivoltine | 69 | 29.76 |
| Univoltine | 140 | 60.50 |
| Semivoltine | 23 | 9.74 |

| | #TAXA | ABUNDANCE | PERCENT |
|---|---|---|---|
| Tolerant | 2 | 18 | 7.79 |
| Intolerant | 4 | 19 | 8.23 |
| Clinger | 14 | 104 | 45.02 |